The Robber Fly *Callinicus calcaneus* (Loew) As A Predator on *Andrena omninigra* Viereck

(Diptera: Asilidae; Hymenoptera: Andrenidae)

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In an earlier note, (Linsley, 1944), I reported on the predatory behavior of 22 individuals from a population of *Callinicus calcaneus* (Loew) foraging on a hillside near Oakhurst, Madera County, California, which was densely clothed with the common ground cover of the lower Sierra Nevada yellow pine forests known as mountain misery or bear-clover (*Chaemaebatia foliolosa* Benth.). The robber flies were capturing bees which were taking pollen and/or nectar from *Chaemaebatia* blossoms. The prey in this sample consisted entirely of solitary bees of the families Megachilidae and Andrenidae (*Osmia* spp. and *Andrena* spp.). Among the captures, brightly colored *Osmia* outnumbered dull colored *Andrena* by approximately 3:1, although sweep samples of *Chaemaebatia* blossoms yielding 536 individual bees indicated that *Andrena* outnumbered *Osmia* by about 5:1. It appeared that the asilids were selectively capturing the brilliant or metallic colored *Osmia*. The flies were foraging in the brightly sunlit areas among the trees where most of the bees were working and their prey were captured while in flight between flowers.

It has been suggested previously that bee- and wasp-killing robber flies tend to locate a suitable foraging site and remain there, selecting their prey either fortuitously or on the basis of size, coloration, or some other identifiable attribute, depending upon the extent and range of choice and prior experience (cf. Linsley, 1960). Further evidence that this may be true in the case of *Callinicus calcaneus* was obtained on 2 June through 5 June 1970 on a hillside 1.5 miles east of Railroad Flat, Calaveras County, California. Here, as in the Madera County locality, the robber flies were foraging over *Chaemaebatia foliolosa*. However, unlike the earlier situation the observed prey, with one exception, were exclusively females of *Andrena* (*Onagrandrena*) *omninigra omnigra* Viereck, a wholly black species which was taking nectar from blossoms of those *Chaemaebatia* plants which were shaded by scattered pine trees (*Pinus ponderosa*). They were the dominant bees visiting *Chaemaebatia* at this time but by no means the only ones. The others, although relatively few in numbers, were confined to sunny areas and

THE PAN-PACIFIC ENTOMOLOGIST 48: 94–96. April 1972

involved both sexes of two species of brightly colored *Osmia* and two *Andrena* species, the females of which were taking pollen. However, based on collections from the same hillside in the previous year, these must have been early seasonal arrivals because in late June of 1969 *Osmia* and *Andrena* were abundantly active both in individuals and species, with much the same species composition as that found at the Oakhurst site.

These observations suggest that when *Callinicus calcaneus* adults emerged (the individuals seen still had their wing margins and body pubescence intact) the first prey encountered were the densely black *Onagrandrena*, which were probably seeking nectar from shaded rather than sunlit plants in order to minimize integumental heat absorption while feeding in the exposed cup-like flowers. Presumably having learned to exploit bees in this situation the robber flies retained this behavior pattern while the *Onagrandrena* remained abundant, in spite of the increasing availability of suitable prey on plants in adjacent sunny sites. Regrettably, the locality could not be revisited after an interval of ten days or two weeks to observe the behavior of *Callinicus* at that time.

Altogether, 15 female *Onagrandrena* were taken from *Callinicus* by observing their capture, which invariably took place when the bees were in flight. The robber flies were swept gently into the net shortly after they settled on a plant with their prey, and were allowed to drop the then dead bee in the net and escape with a minimum of disturbance. Under these circumstances marking was not feasible and it is not possible to say with certainty whether or not the same robber fly was captured more than once, although the presumption is high that this may have been so, since only one or two individuals of *Callinicus* were visible in the observation area at any one time. Also, the *Onagrandrena* were localized to shady spots in an area about 65 yards long by 50 yards wide near a dirt road, although *Chaemaebatia* extended on both sides of the road for hundreds of yards. However, *Callinicus* are fast fliers and cover more territory than many other asilid bee predators. They moved in and out of this foraging site, both when disturbed and undisturbed.

It should be noted that *Andrena* (*Onagrandrena*) *omninigra* is a *Clarkia* (Onagraceae) oligolege, yet none of the females had traces of *Clarkia* pollen in their scopae and, as would be expected, none were taking pollen from *Chaemaebatia* (Rosaceae). No *Clarkia* plants were evident near the site where the females were working and the only colony of *Clarkia* noted in prior years, a substantial population of *C. speciosa*, was slightly more than one air mile away on the other side of two 300 to 500 ft. ridges. On this date these plants were examined but they were not yet in bloom. Although they had been sampled twice in previous years, other *Clarkia* oligoleges were abundant but no *Onagrandrena* were present in the collections. The localized occurrence of the females in an extensive area of *Chaemaebatia*, and the capture of a male nearby, suggested that they might be coming from an adjacent nest site, but a careful search failed to reveal one if it was in the vicinity.

Diurnally, the earliest *Callinicus* with *Onagrandrena* prey was observed at 8:30 a.m. PST, the latest at 4 p.m. Most were taken shortly before noon (11–11:30 a.m.) and at mid-afternoon (3–3:30 p.m.) although the site was visited intermittently during several days, it was not under continuous surveillance on any one day.

The identification of two female *Callinicus calcaneus* captured as voucher specimens was kindly confirmed by E. I. Schlinger.

LITERATURE CITED

LINSLEY, E. G. 1944. Prey of the robber fly, *Callinicus calcaneus* Loew (Diptera: Asilidae). Pan-Pac. Entomol., 20: 67–68.

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